(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 225 263 B1

(12) EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent: **30.03.2005 Bulletin 2005/13**

(51) Int Cl.^{7}: **D04H 3/16**

(21) Application number: **01129610.0**

(22) Date of filing: **12.12.2001**

(54) Air management system for the manufacture of nonwoven webs and laminates

Luftverwaltungssystem zur Herstellung von Vliesstoffen und Verbundvliesstoffen

Système de gestion d'air pour la production de bandes non-tissées et de laminés

(84) Designated Contracting States:
DE IT

(30) Priority: **28.12.2000 US 750820**

(43) Date of publication of application:
24.07.2002 Bulletin 2002/30

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EP 1 225 263 B1

Description

Field of the Invention

[0001] The present invention generally relates to apparatus and methods for managing air flow during the manufacture of nonwoven webs and laminates.

Background of the Invention

[0002] Meltblowing and spunbond processes are commonly employed to manufacture nonwoven webs and laminates. With meltblowing, a molten thermoplastic is extruded from a die tip to form a row of filaments or fibers. Converging sheets or jets of hot air impinge upon the fibers as they are extruded from the die tip to stretch or draw the fibers, thereby reducing the diameter of the fibers. The fibers are then deposited in a random manner onto a moving collector belt to form a nonwoven web.

[0003] With spunbond processes, continuous fibers are extruded through a spinneret. Air is directed at the extruded fibers to separate and orient them. The fibers are collected onto a moving collector belt. At a downstream location, the fibers are consolidated by passing the layer of fibers through compacting roller, for instance. The spunbond process frequently utilizes quenching air to cool the extruded before they contact the collector belt.

[0004] Large volumes of air are used during both the meltblown and spunbond process. Moreover, much of the air is heated and moving at very high velocities, sometimes approaching the speed of sound. Without properly collecting and disposing of the process air, the air would likely disturb personnel working around the manufacturing apparatus and other nearby equipment. Further, the heated air would likely heat the surrounding area in which the nonwoven is being produced. Consequently, attention must be paid to collecting and disposing of this process air.

[0005] Managing the process air is also important to producing a homogeneous nonwoven web across the width of the web. The homogeniety of the final nonwoven web depends greatly on the air flow around the fibers as they are deposited onto the collector belt. For instance, if the air flow velocity is not uniform in the cross-machine direction, the fibers will not be deposited onto the collector belt uniformly, yielding a non-homogeneous nonwoven web.

[0006] Various air management systems have been used to collect and dispose of the process air. One particular air management system uses a collecting duct situated below a perforated collector belt to collect and dispose of the process air. An air moving device, such as a fan or vacuum pump, is connected to the collecting duct to actively draw the air into the collecting duct. The collecting duct is comprised of a plurality of a smaller air passageways arranged side-by-side in a rectangular grid. The grid includes a central row of air passageways extending across the machine width and upstream and downstream air passageways flanking either side of the central row. The central row of air passageways is disposed directly below the extrusion die in what is commonly referred to as the forming zone. Each air passageway includes an inlet and an outlet with a 90 degree elbow in between. An air moving device is operatively connected to each outlet to draw the process air into the individual inlets.

[0007] As mentioned above, the air flow velocity of the process air around the collector belt should be uniform, especially in the machine direction at the forming zone, to form a homogeneous nonwoven web. Achieving a uniform air flow velocity, however, has proven challenging. In the collecting duct described above, moveable dampers are associated with each outlet of the air passageways. To achieve uniform air flow velocity with this collecting duct, an technician must manually manipulate each damper until the air flow velocity is sufficiently uniform. In some instances, the technician may be unable to achieve a uniform air flow velocity no matter how much time and effort is spent adjusting the dampers. Moreover, the dampers must be readjusted each time a different fiber material or process air flow rate is used. Thus, the operator must readjust the damper virtually every time the process is started or an operating condition is changed. The readjustment process takes a great deal of time and may ultimately yield a nonuniform air flow velocity regardless of how the moveable dampers are adjusted.

[0008] What is needed, therefore, is an air management system that can collect and dispose of the process air so as to produce a uniform air flow velocity at the collector belt, especially around the forming zone. The air management system should be designed such that dampers and other manual controls are not necessary, even over a wide range of process air flow rates.

Summary of the Invention

[0009] The present invention provides a meld spinning system and, more particularly, a melt spinning and air management system that overcomes the drawbacks and disadvantages of prior air management systems.

[0010] The air management system collects air discharged from a melt spinning apparatus configured to discharge filaments of material onto a collector moving in a machine direction. Said air management system comprising a first air handler comprising:

an outer housing having walls defining a first interior space, one of said walls forms the top of said outer housing and has an intake opening for receiving the discharged air, another one of said walls has an exhaust opening and yet another one of said walls forms the bottom of said outer housing, said intake opening is in fluid communication with said first in-

terior space;
an inner housing positioned within said first interior space and having walls defining a second interior space, one of said walls of said inner housing forms the bottom of said inner housing and has an elongate slot extending lengthwise across the machine direction of the melt spinning apparatus, said bottom wall is proximate to said bottom of the outer housing, said first interior space is in fluid communication with said second interior space through said slot, said second interior space is in fluid communication with said exhaust opening.

[0011] In accordance with a general objective of the invention, the air handler produces a uniform air flow velocity in at least the cross-machine direction as the air enters the air handler. This is accomplished without the typical adjustable buffers and dampers required in the past. The first air handler generally includes an outer housing having walls defining a first interior space. One of the walls forms the top of the outer housing and has an intake opening for receiving the discharged air from melt spinning apparatus. Another wall has an exhaust opening for discharging the air collected by the air handler. The intake opening is in fluid communication with first interior space. An inner housing is positioned within the first interior space and has walls defining a second interior space. One of said walls of said inner housing forms the bottom of said inner housing and has an elongate slot extending lengthwise across the machine direction of a melt spinning apparatus. The first interior space communicates with the second interior space through the opening. The second interior space is in fluid communication with the exhaust opening.

[0012] Preferably the elongate slot includes a center portion having a wider dimension than the end portions thereof. The intake opening is positioned at the top of the outer housing and the slot in the inner housing is disposed proximate to the bottom of the outer housing. The outer housing can further include a filter member for filtering particulates from the air discharged by the melt spinning apparatus.

[0013] In a preferred embodiment of the invention the air management system further comprises second and third air handler, wherein the second air handler is positioned directly below the melt spinning apparatus in a forming zone;
said first air handler is positioned upstream of said second air handler and the forming zone;
said third air handler is positioned downstream of said second air handler and the forming zone; and
said second and third air handler each comprising:

an outer housing having walls defining a first interior space, one of said walls forms the top of said outer housing and has an intake opening for receiving the discharged air, another one of said walls has an exhaust opening and yet another one of said walls forms the bottom of said outer housing, said intake opening is in fluid communication with said first interior space;
an inner housing positioned within said first interior space and having walls defining a second interior space, one of said walls of said inner housing forms the bottom of said inner housing and has an elongate slot extending lengthwise across the machine direction of the melt spinning apparatus, said bottom wall is proximate to said bottom of the outer housing, said first interior space is in fluid communication with said second interior space through said slot, said second interior space is in fluid communication with said exhaust opening.

[0014] The invention further provides a method of melt spinning filaments from a melt spinning apparatus onto a collector moving in a machine direction in managing air discharged from the melt spinning apparatus, comprising:

extruding the filaments from the melt spinning apparatus toward the collector;
impinging the filaments with air to attenuate the filaments before the filaments contact the collector;
drawing the air into an intake of an air management system having a fixed non-moveable interior geometry, the intake having a length extending transverse to the machine direction;
directing the air from the intake through the air management system causing the air along the length of the intake to have a substantially uniform velocity profile; and
collecting the filaments into a first layer on the collector.

[0015] Various additional advantages and features of the invention will become more readily apparent to those of ordinary skill in the art upon review of the following detailed description taken in conjunction with the accompanying drawings.

<u>**Detailed Description of Drawings**</u>

[0016]

Fig. 1 is a schematic plan view of a two-station production line incorporating the air management system of the invention;

Fig. 2 is a perspective view of the two-station production line of Fig. 1 with the collector belt removed for clarity;

Fig. 3 is a perspective view of the air management system of Fig. 1;

Fig. 4 is a partially disassembled perspective view

of the forming zone air handler of Fig. 3;

Fig. 5 is a cross sectional view of the forming zone air handler in Fig. 4 taken along lines 5-5;

Fig. 6 is a plan view of the forming zone air handler bottom in Fig. 4 taken along lines 6-6;

Fig. 7 is a partially disassembled perspective view of one of the spillover air handlers of Fig. 3;

Fig. 8 is a perspective view of another embodiment of the air management system of the invention; and

Fig. 9 is cross sectional perspective view of the air management system in Fig. 8 taken along lines 9-9.

Detailed Description of Preferred Embodiments

[0017] With reference to Fig. 1, a two-station production line 10 is schematically illustrated. The production line 10 incorporates an air management system 12 of the invention at both an upstream station 14 and a downstream station 16. While the air management system 12 has been illustrated in conjunction with the two-station production line 10, the air management system 12 is generally applicable to other production lines having a single station or a plurality of stations. In a single station production line, the nonwoven web can be manufactured using any one of a number of process, such as a meltblowing process or a spunbond process. In a multiple-station production line, a plurality of nonwoven webs can be manufactured to form a multiply laminate. Any combination of meltblowing and spunbonding processes may be used to manufacture the laminate. For instance, the laminate may include only nonwoven meltblown webs or only nonwoven spunbond webs. However, the laminate may include any combination of meltblown webs and spunbond webs.

[0018] The two-station production line 10 in Fig. 1 is shown forming a two-ply laminate 18 with a meltblown layer or web 20 on the bottom and a spunbond layer or web 22 on the top. The two-ply laminate 18 is consolidated downstream using compacting rolls, for example. The upstream station 14 includes a melt spinning assembly 24 with a meltblowing die 26 and the downstream station 16 includes a melt spinning assembly 28 with a spunbond die 30.

[0019] To form the meltblown web 20, the meltblowing die 26 extrudes a plurality of thermoplastic filaments or fibers 32 onto a collector such as a belt 34. It will be appreciated that the collector 34 may be any other substrate, such as a substrate used as a component in the manufacture of a product. Converging sheets or jets of hot air, indicated by arrows 36, from the meltblowing die 26 impinge upon the fibers 32 as they are extruded to stretch or draw the fibers 32. The fibers 32 are then deposited in a random manner onto the collector moving belt 34 from right to left to form the meltblown web 20. The collector belt 34 is perforated to permit the air to flow through the collector belt 34 and into the air management system 12.

[0020] Similarly, to form the spunbond web 22, the spunbond die 30 extrudes a plurality of thermoplastic filaments or fibers 38 onto the meltblown web 20 being transported by the moving collector belt 34. Hot air, indicated by arrows 40, from the spunbond die 30 impinges upon the fibers 38 to impart rotation to the fibers 38. Additionally, air ducts 42 direct quenching air onto the extruded fibers 38 to cool the fibers 38 before they reach the meltblown web 20. As with the upstream station 14, the air at downstream station 16 passes through the nonwoven web 20 and the collector belt 34 and into the air management system 12.

[0021] Several cubic feet (0,028 cubic meter) of air per minute per inch (2,54cm) of die length flow through each station 14, 16 during the manufacture of the melblown and spunbond webs 20, 22. The air management system 12 of the invention efficiency collects and disposes of the air from through the stations 14, 16. More importantly and as will be discussed in greater detail below, the air management system 12 collects the air such that the air has a substantially uniform flow velocity at least in the cross-machine direction as the air passes through the collector belt 34. Ideally, the fibers 32, 38 are deposited on the collector belt 34 in a random fashion to form the metlblown and spunbond webs 20, 22 which are homogeneous. If the air flow velocity through the collector belt 34 is nonuniform, the resultant web will likely not be homogeneous.

[0022] With reference to Fig. 2, transport structure 50 of the two-station production line 10 of Fig. 1 is shown. While the two-station production line 10 includes two air management systems 12, the following description will focus on the air management system 12 associated with the upstream station 14. Nevertheless, the description will be equally applicable to the air management system associated with downstream station 16.

[0023] With further reference to Figs. 2 and 3, air management system 12 includes three discrete air handlers 52, 54, 56 disposed directly below the collector belt 34. Air handlers 52, 54, 56 include intake openings 58, 60, 62 and oppositely disposed exhaust openings 64, 66, 68. Individual exhaust conduits 70, 72, 74 are connected respectively to exhaust openings 64, 66, 68. With specific reference to Fig. 3, exhaust conduit 70, which is representative of exhaust conduits 72, 74, is comprised of a series of individual components: first elbows 76, second elbows 78, elongated portion 80, down portion, and third elbow. A series of parallel guide vanes extend through down portion 82 and third elbow. In operation, a variable speed fan (not shown) or any other suitable air moving device is connected to third elbow to draw the air through the air management system 12.

[0024] With continued reference to Figs. 2 and 3, air handler 54 is located directly below the forming zone, i.

e., the location where the fibers contact the collector belt 34. As such, air handler 54 collects and disposes of the largest portion of air used during the extrusion process. Upstream air handler 56 and downstream air handler 52 collect spill over air which air handle 54 does not collect.

[0025] With reference now to Figs. 4-6, forming zone air handler 54 includes an outer housing 94 which includes intake opening 60 and oppositely disposed exhaust openings 66. Intake opening 60 includes a perforated cover 96 with a series of apertures through which the air flows. Depending of the manufacturing parameters, air handler 54 may be operated without using the perforated cover 96 at all. Air handler 54 further includes an inner housing or box 98 which is suspended from the outer housing 94 by means of spacing members 100 which include a plurality of openings 101 therein. Two filter members 102, 104 are selectively removable from air handler 54 so that they may be periodically cleaned. The filter members 102, 104 slide along stationary rail members 106, 108. Each of these filter members 102, 104 are perforated with a series of apertures through which the air flows.

[0026] The inner box 98 has a bottom panel 110 that includes an opening such as slot 112 with ends 114, 116 and a center portion 118. As illustrated in Fig. 6, slot 112 extends substantially across the width, i.e., the cross-machine direction, of the inner box 98. The slot 112 is narrow at ends 114, 116 and widens at center portion 118. The slot 112 could be formed from one or more openings of various shapes, such round, elongate, rectangular, etc.

[0027] The shape of slot 112 influences the air flow velocity in the cross machine direction at the intake opening 60. If the shape of the slot 112 is not properly contoured the air flow velocities at the intake opening 60 may vary greatly in the cross machine direction. The particular shape shown in Fig. 6 was determined through an iterative process using a computational fluid dynamics (CFD) model which incorporated the geometry of the air handler 54. A series of slot shapes were evaluated at intake air flow velocities ranging between 500 to 2500 feet per minute (152 to 762 meter per minute). After the CFD model analyzed a particular slot shape, the air flow velocity profile in the cross machine direction was checked. Ultimately, the goal was to choose a shape for the slot 112 which provided a substantially uniform air flow velocity in the cross machine direction at intake opening 60. Initially, a rectangular slot 112 was evaluated, yielding air flow velocities in the cross machine direction at the intake opening 60 which varied by as much as twenty percent. With the rectangular slot 1 12, the air flow velocities near the ends of the intake opening 60 were greater than the air flow velocities approaching the center of the intake opening 60. To address this uneven air flow velocity profile, the width of ends 114, 116 was reduced relative to the width of the center portion 118. After approximately five iterations, the shape of slot 118 is Fig. 6 was chosen. That slot shape yields air flow velocities in the cross machine direction at the intake opening 56 which varied by $\pm 0.5\%$.

[0028] With specific reference to Fig. 5, air enters through perforated cover 96 and passes through perforated filter members 102, 104 as illustrated by arrows 120. The air passes through the gap between the inner box 98 and the outer housing 94 as illustrated by arrows 122. The air then enters the interior of inner box 98 through slot 112 as illustrated by arrows 124. Finally, the air exits the inner box 98 through exhaust opening 66 as illustrated by arrows 126 and then travels through exhaust conduit 72. The openings 101 in spacing members 100 allow the air to move in the cross-machine direction to minimize transverse pressure gradients.

[0029] Generally, air handlers 52, 56 have a similar construction and air flow path as air handler 54. However, as Fig. 3 illustrates, air handlers 52, 56 have much wider, i.e, in the machine direction, intake openings 58, 62 than intake opening 60 of air handler 54. The width of the these intake openings 58, 62 may vary depending on the particular manufacturing parameters. The following discussion of.air handler 52 is equally applicable to air handler 56. Thus, with specific reference to Fig. 7, air handler 52 includes an outer housing 136 which includes intake opening 58 and exhaust openings 64. intake opening 60 includes a perforated cover 137 with a series of apertures through which the air flows. Depending on the manufacturing parameters, air handler 52 may be operated without using perforated cover 137 at all. Air handler 52 further includes an inner housing or box 138 which is suspended from the outer housing 136 by means of spacing members 140 which include a plurality of openings 142 therein. Unlike air handler 54, air handlers 52, 56 do not include filter members 102, 104.

[0030] The inner box 138 includes a bottom panel 144 with a slot 146 which is configured similarly to slot 112. Slot 146 includes ends 148, 150 and center portion 152. Like slot 112, the width at center portion 152 is greater than the width at ends 148, 150.

[0031] As mentioned above, the air flow path through air handler 52 is similar to the air flow path in air handler 54. Specifically, air enters through perforated cover 137 as illustrated by arrows 154 and passes through the gap between the inner box 138 and the outer housing 136 as illustrated by arrows 156. The air then enters the interior of inner box 138 through slot 146 as illustrated by arrow 158. Finally, the air exits the inner box 138 through exhaust opening 64 as illustrated by arrow 160 and then travels through exhaust conduit 70. The openings 142 in spacing members 140 allow the air to move in the cross-machine direction to minimize transverse pressure gradients.

[0032] Another embodiment of the air management system of the invention is shown generally as 170 in Figs. 8 and 9. As described above, air management system 12 includes three separate and discrete air handlers 52, 54, 56. In contrast, air management system 170 includes air handlers 172, 174, 176 which share common

walls to form a unitary device. Air handler 174 is placed under the forming zone of the production line to collect the majority of the process air and air handlers 172, 176 collect spill over air which air handler 174 does not collect. Each air handler 172, 174, 176 includes an intake opening 178, 180, 182 over which a single perforated cover 184 is placed. A plurality of individual perforated covers may be used in place of the single perforated cover 184. Each air handler 172, 174, 176 further includes exhaust openings 186, 188, 190 oppositely. disposed on either end of the respective air handlers 172, 174, 176. Separate exhaust conduits (not shown) similar to exhaust conduits 70, 72, 74 connect to exhaust openings 186, 188, 190 to pull the air out of the air handlers 172, 174, 176. Air handler 174 may include a filter member having a perforated surface through which the incoming air flows.

[0033] Air handlers 172, 174, 176 include inner boxes 192, 194, 196 and sidewalls 198, 200, 202, 204. Spacing members 206, 208, 210 hold inner boxes 192, 194, 196 away from sidewalls 198, 200, 202, 204. Inner boxes 192, 194, 196 include bottom panels 212, 214, 216 having slots 218, 220, 222. The air flow path through air handlers 172, 174, 176 is similar to the air flow path in air handlers 52, 54, 56. The air flow path through air handler 74 is represented by arrows 224.

[0034] While the present invention has been illustrated by a description of various preferred embodiments and while these embodiments have been described in considerable detail in order to describe the best mode of practicing the invention, it is not the intention of applicants to restrict or in any way limit the scope of the appended claims to such detail. Additional advantages and modifications within the scope of the invention will readily appear to those skilled in the art. The invention itself should only be defined by the appended claims.

Claims

1. An air management system (12) for collecting air discharged from a melt spinning apparatus (24) configured to discharge filaments (32, 38) of material onto a collector (34) moving in a machine direction, said air management system comprising a first air handler (54) comprising:

    an outer housing (94) having walls defining a first interior space, one of said walls forms the top of said outer housing and has an intake opening (60) for receiving the discharged air, another one of said walls has an exhaust opening (66) and yet another one of said walls forms the bottom of said outer housing, said intake opening is in fluid communication with said first interior space;
    an inner housing (98) positioned within said first interior space and having walls defining a second interior space, one of said walls of said inner housing forms the bottom (110) of said inner housing and has an elongate slot (112) extending lengthwise across the machine direction of the melt spinning apparatus, said bottom wall is proximate to said bottom of the outer housing, said first interior space is in fluid communication with said second interior space through said slot, said second interior space is in fluid communication with said exhaust opening and said elongate slot has a center portion (118) with a first width and oppositely disposed end portions (114, 116) each with a second width, said first width being greater than said second width.

2. The air management system of claim 1, wherein said outer housing further including a filter member (102, 104) for filtering particulates from the air discharged by the melt spinning apparatus.

3. The air management system of claim 1 further comprising second and third air handlers (52, 56)
said second air handler is positioned directly below the melt spinning apparatus in a forming zone;
said first air handler is positioned upstream of said second air handler and the forming zone;
said third air handler is positioned downstream of said second air handler and the forming zone; and
said second and third air handler each comprising:

    an outer housing having walls defining a first interior space, one of said walls forms the top of said outer housing and has an intake opening for receiving the discharged air, another one of said walls has an exhaust opening and yet another one of said walls forms the bottom of said outer housing, said intake opening is in fluid communication with said first interior space;
    an inner housing positioned within said first interior space and having walls defining a second interior space, one of said walls of said inner housing forms the bottom of said inner housing and has an elongate slot extending lengthwise across the machine direction of the melt spinning apparatus, said bottom wall is proximate to said bottom of the outer housing, said first interior space is in fluid communication with said second interior space through said slot, said second interior space is in fluid communication with said exhaust opening; and
    wherein each of said elongated slots of said first, second and third air handlers has a center portion with a first width and oppositely disposed end portions each with a second width, said first width is greater than said second width.

4. The air management system of claim 3, wherein said outer housing of each of said air handlers has a top and a bottom, one of said walls of said outer housing of each of said air handlers is a top wall and has said intake opening, another one of said walls is a bottom wall and each of said exhaust openings of each inner housing is positioned proximate to a respective one of said bottom wall of each of said outer housings.

5. The air management system of claim 3, wherein said outer housing of each of said air handlers further includes a filter member for filtering particulates from the air discharged by the melt spinning apparatus.

6. The air management system of claim 3, wherein said intake opening (58, 60, 62) of each of said air handlers has a width in the machine direction, said width of said intake opening of said first and third air handlers (56, 52) in the machine direction is greater than the width of said intake opening of said second air handler (54).

7. The air management system of claim 3, wherein each air handler is separate and distinct from the other air handlers.

8. A method of melt spinning filaments from a melt spinning apparatus onto a collector moving in a machine direction and managing air discharged from the melt spinning apparatus, comprising:

extruding a plurality of thermoplastic filaments from the melt spinning apparatus toward the collector;
impinging the filaments with hot air to attenuate the filaments before the filaments contact the collector;
drawing the air into an intake opening of an air management system having an interior free of adjustable baffles and dampers, the intake opening having a length extending transverse to the machine direction;
directing the air from the intake
through an elongate slot and out of the air management system, said elongate slot extending lengthwise across the machine direction of the melt spinning apparatus, and having a center portion with a first width and oppositely disposed end portions each with a second width, said first width being greater than said second width,
thereby causing the air along the length of the intake to have a substantially uniform velocity; and
collecting the filaments into a first layer on the collector.

9. The method of claim 8, further comprising:

melt spinning at least one additional layer (22) of filaments onto the first layer (20).

10. The method of claim 8 wherein said directing the air through the air management system further comprises:

directing the air from the intake to a first interior space defined by the walls of an outer housing and an inner housing positioned within the first interior space;
directing the air into an elongate intake of the inner housing, the elongate intake having a length extending transverse to the machine direction and a center section which is wider in the machine direction than opposite end section; and
directing the air out of the inner housing.

11. The method of claim 8, further comprising:

filtering particles from the air used to attenuate the filaments.

Patentansprüche

1. Luftverwaltungssystem (12) zum Sammeln von Luft, die von einer Schmelzspinnvorrichtung (24) ausgelassen wird, die zum Auslassen von Materialfäden (32, 38) auf einen Kollektor (34) konfiguriert ist, der sich in einer Laufrichtung bewegt, wobei das Luftverwaltungssystem einen ersten Luftantrieb (54) enthält, umfassend:

ein Außengehäuse (94) mit Wänden, die einen ersten Innenraum definieren, wobei eine der Wände den Deckel des Außengehäuses bildet und eine Einlassöffnung (60) zum Aufnehmen der Abluft hat, eine andere der Wände eine Auslassöffnung (66) hat und noch eine andere der Wände den Boden des Außengehäuses bildet, wobei die Einlassöffnung in Fließverbindung mit dem ersten Innenraum steht;

weiter umfassend ein Innengehäuse (98), das in dem ersten Innenraum positioniert ist und Wände hat, die einen zweiten Innenraum definieren, wobei eine der Wände des Innengehäuses dessen Boden (110) bildet und einen länglichen Schlitz (112) hat, der sich quer über die Laufrichtung der Schmelzspinnvorrichtung erstreckt, wobei die Bodenwand dem Boden des Außengehäuses nahe liegt, der erste Innenraum mit dem zweiten Innenraum durch den Schlitz in Fließverbindung steht, der zweite In-

nenraum in Fließverbindung mit der Auslassöffnung steht und

der längliche Schlitz einen Mittelteil (118) mit einer ersten Breite und gegenüberliegende Endteile (114, 116), jedes mit einer zweiten Breite, hat, wobei die erste Breite größer als die zweite Breite ist.

2. Luftverwaltungssystem nach Anspruch 1, bei dem das Außengehäuse ferner einen Filter (102, 104) zum Filtern von Partikeln aus der von der Schmelzspinnvorrichtung ausgelassenen Luft beinhaltet.

3. Luftverwaltungssystem nach Anspruch 1, ferner umfassend einen zweiten und dritten Luftantrieb (52, 56),
von denen der zweite Luftantrieb direkt unter der Schmelzspinnvorrichtung in einer Formungszone positioniert ist;
der erste Luftantrieb dem zweiten Luftantrieb und der Formungszone vorgelagert ist;
der dritte Luftantrieb dem zweiten Luftantrieb und der Formungszone nachgelagert ist; und
der zweite und dritte Luftantrieb jeweils umfassen:

ein Außengehäuse mit Wänden, die einen ersten Innenraum definieren, von denen eine der Wände den Deckel des Außengehäuses bildet und eine Einlassöffnung zum Aufnehmen der Abluft hat, eine andere der Wände eine Auslassöffnung hat und noch eine andere der Wände den Boden des Außengehäuses bildet, und die Einlassöffnung in Fließverbindung mit dem ersten Innenraum steht;

weiter umfassend ein Innengehäuse, das in dem ersten Innenraum positioniert ist und Wände hat, die einen zweiten Innenraum definieren, von denen eine den Boden des Innengehäuses bildet und einen länglichen Schlitz hat, der sich quer über die Laufrichtung der Schmelzspinnvorrichtung erstreckt, wobei die Bodenwand dem Boden des Außengehäuses nahe liegt, der erste Innenraum mit dem zweiten Innenraum durch den Schlitz in Fließverbindung steht, der zweite Innenraum in Fließverbindung mit der Auslassöffnung steht; und

jeder der länglichen Schlitze des ersten, zweiten und dritten Luftantriebs einen Mittelteil mit einer ersten Breite und gegenüberliegende Endteile, jedes mit einer zweiten Breite, hat, und die erste Breite größer als die zweite Breite ist.

4. Luftverwaltungssystem nach Anspruch 3, bei dem das Außengehäuse jedes Luftantriebs einen Deckel und einen Boden hat, eine der Wände des Außengehäuses jedes Luftantriebs eine Deckelwand ist und eine Einlassöffnung hat, eine andere Wand eine Bodenwand ist und jede Auslassöffnung jedes Innengehäuses nahe einer entsprechenden Bodenwand jedes Außengehäuses positioniert ist.

5. Luftverwaltungssystem nach Anspruch 3, worin das Außengehäuse jedes Luftantriebs ferner einen Filter zum Filtern von Partikeln aus der von der Schmelzspinnvorrichtung ausgelassenen Luft beinhaltet.

6. Luftverwaltungssystem nach Anspruch 3, bei dem die Einlassöffnung (58, 60, 62) jedes Luftantriebs eine Breite in der Laufrichtung hat, und die Breite der Einlassöffnung des ersten und dritten Luftantriebs (56, 52) in Laufrichtung größer ist, als die Breite der Einlassöffnung des zweiten Luftantriebs (54).

7. Luftverwaltungssystem nach Anspruch 3, bei dem jeder Luftantrieb separat und verschieden von den anderen Luftantrieben ist.

8. Verfahren zum Schmelzspinnen von Fäden aus einer Schmelzspinnvorrichtung auf einen Kollektor, der sich ein einer Laufrichtung bewegt und die von der Schmelzspinnvorrichtung ausgelassene Luft verwaltet, umfassend die Schritte:

Extrudieren einer Vielzahl thermoplastischer Fäden aus der Schmelzspinnvorrichtung in Richtung Kollektor;

Aufblasen von heißer Luft auf die Fäden zum Dehnen der Fäden, bevor die Fäden den Kollektor berühren;

Einsaugen der Luft in eine sich quer zur Laufrichtung erstreckende Einlassöffnung eines Luftverwaltungssystems mit einem von einstellbaren Ablenkplatten und Klappen freien Inneren;

Lenken der Luft vom Einlass durch einen länglichen Schlitz, der sich quer über die Laufrichtung der Schmelzspinnvorrichtung erstreckt, und einen Mittelteil mit einer ersten Breite und gegenüberliegende Endteile, jedes mit einer zweiten Breite, hat, und die erste Breite größer als die zweite Breite ist, aus dem Luftverwaltungssystem heraus,

wodurch die Luft entlang der Länge des Einlasses geführt wird und eine im Wesentlichen gleichförmige Geschwindigkeit hat; und
Sammeln der Fäden in einer ersten Schicht auf dem

Kollektor.

9. Verfahren nach Anspruch 8, ferner umfassend:

Schmelzspinnen wenigstens einer zusätzlichen Schicht (22) von Fäden auf der ersten Schicht (20).

10. Verfahren nach Anspruch 8, bei dem das Lenken der Luft durch das Luftverwaltungssystem ferner umfasst:

Lenken der Luft vom Einlass zu einem ersten Innenraum, definiert durch die Wände eines Außengehäuses und eines Innengehäuses, das in dem ersten Innenraum positioniert ist;

Lenken der Luft in einen länglichen Einlass des Innengehäuses, der sich quer zur Laufrichtung erstreckt und einen Mittelteil hat, der in Laufrichtung breiter ist als die gegenüberliegenden Endteile; und weiter umfassend

Lenken der Luft aus dem Innengehäuse heraus.

11. Verfahren nach Anspruch 8, ferner umfassend:

Filtern von Partikeln aus der zum Dehnen der Fäden verwendeten Luft.

Revendications

1. Système de gestion de l'air (12) pour collecter de l'air déchargé d'un appareil de filage par fusion (24) destiné à décharger des filaments (32, 38) de matériau sur un collecteur (34) se déplaçant dans un sens machine, ledit système de gestion de l'air comprenant une première section de traitement de l'air (54), comprenant:

un boîtier externe (94) comportant des parois définissant un premier espace interne, une desdites parois formant la partie supérieure dudit boîtier externe et comportant une ouverture d'admission (60) pour recevoir l'air déchargé, une autre desdites parois comportant une ouverture d'évacuation (66) et encore une autre desdites parois formant la partie inférieure dudit boîtier externe, ladite ouverture d'admission étant en communication de fluide avec ledit premier espace interne;
un boîtier interne (98) positionné dans ledit premier espace interne et comportant des parois définissant un deuxième espace interne, une desdites parois dudit boîtier interne formant la partie inférieure (110) dudit boîtier interne et comportant une fente allongée (112) s'étendant longitudinalement à travers le sens machine de l'appareil de filage par fusion, ladite paroi inférieure étant proche de ladite partie inférieure dudit boîtier externe, ledit espace interne étant en communication de fluide avec ledit deuxième espace interne par l'intermédiaire de ladite fente, ledit deuxième espace interne étant en communication de fluide avec ladite ouverture d'évacuation, et
ladite fente allongée comportant une partie centrale (118) ayant une première largeur et des parties d'extrémité à agencement opposé (114, 116), ayant chacune une deuxième largeur, ladite première largeur étant supérieure à ladite deuxième largeur.

2. Système de gestion d'air selon la revendication 1, dans lequel ledit boîtier externe englobe en outre un élément de filtre (102, 104) pour filtrer les matières particulaires de l'air déchargé par l'appareil de fusion par filage.

3. Système de gestion d'air selon la revendication 1, comprenant en outré des deuxième et troisième sections de traitement d'air (52, 56),
ladite deuxième section de traitement d'air étant positionnée directement au-dessous de l'appareil de filage par fusion dans une zone de formage;
ladite première section de traitement d'air étant positionnée en amont de ladite deuxième section de traitement d'air et de la zone de formage;
ladite troisième section de traitement d'air étant positionnée en aval de ladite deuxième section de traitement d'air et de la zone de formage; et
lesdites deuxième et troisième sections de traitement d'air comprenant chacune:

un boîtier externe comportant des parois définissant un premier espace interne, une desdites parois formant la partie supérieure dudit boîtier externe et comportant une ouverture d'admission pour recevoir l'air déchargé, une autre desdites parois comportant une ouverture d'évacuation et encore une autre desdites parois formant la partie inférieure dudit boîtier externe, ladite ouverture d'admission étant en communication de fluide avec ledit premier espace interne;

un boîtier interne positionné dans ledit premier espace interne et comportant des parois définissant un deuxième espace interne, une desdites parois dudit boîtier interne formant la partie inférieure dudit boîtier interne et comportant une fente allongée s'étendant longitudinalement à travers le sens machine de l'appareil de

filage par fusion, ladite paroi inférieure étant proche de ladite partie inférieure dudit boîtier externe, ledit espace interne étant en communication de fluide avec ledit deuxième espace interne par l'intermédiaire de ladite fente, ledit deuxième espace interne étant en communication de fluide avec ladite ouverture d'évacuation, et

chacune desdites fentes allongées desdites première, deuxième et troisième sections de traitement d'air comportant une partie centrale ayant une première largeur et des parties d'extrémité à agencement opposé, ayant chacune une deuxième largeur, ladite première largeur étant supérieure à ladite deuxième largeur.

4. Système de gestion d'air selon la revendication 3, dans lequel ledit boîtier externe de chacune desdites sections de traitement d'air comporte une partie supérieure et une partie inférieure, une desdites parois dudit boîtier externe de chacune desdites sections de traitement d'air constituant une paroi supérieure et comportant ladite ouverture d'admission, une autre desdites parois constituant une paroi inférieure, chacune desdites ouvertures d'évacuation de chaque boîtier interne étant positionnée près d'une paroi inférieure respective de chacun desdits boîtiers externes.

5. Système de gestion d'air selon la revendication 3, dans lequel ledit boîtier externe de chacune desdites sections de traitement d'air englobe en outre un élément de filtre pour filtrer les matières particulaires de l'air déchargé par l'appareil de filage par fusion.

6. Système de gestion d'air selon la revendication 3, dans lequel ladite ouverture d'admission (58, 60, 62) de chacune desdites sections de traitement d'air a une largeur dans le sens machine, ladite largeur de ladite ouverture d'admission desdites première et troisième sections de traitement d'air (56, 52) dans le sens machine étant supérieure à la largeur de l'ouverture d'admission de ladite deuxième section de traitement d'air (54).

7. Système de gestion d'air selon la revendication 3, dans lequel chaque section de traitement d'air est séparée et distincte des autres sections de traitement d'air.

8. Procédé de filage par fusion de filaments à partir d'un appareil de filage par fusion sur un collecteur se déplaçant dans un sens machine et traitant l'air déchargé de l'appareil de filage par fusion, comprenant les étapes ci-dessous:

extrusion de plusieurs filaments thermoplastiques de l'appareil de filage par fusion vers le collecteur;

mise en contact par impact des filaments avec de l'air chaud pour atténuer les filaments avant le contact des filaments avec le collecteur;

aspiration d'air dans une ouverture d'admission d'un système de gestion d'air comportant un intérieur exempt de déflecteurs et de clapets ajustables, l'ouverture d'admission ayant une longueur s'étendant transversalement au sens machine;

guidage de l'air à partir de l'ouverture d'admission à travers une fente allongée et hors du système de gestion d'air, ladite fente allongée s'étendant longitudinalement à travers le sens machine de l'appareil de filage par fusion, et comportant une partie centrale avec une première largeur et des parties d'extrémité à agencement opposé, ayant chacune une deuxième largeur, ladite première largeur étant supérieure à ladite deuxième largeur,

pour conférer ainsi une vitesse pratiquement uniforme à l'air le long de la longueur de l'ouverture d'admission; et

collecte des filaments dans une première couche sur le collecteur.

9. Procédé selon la revendication 8, comprenant en outre l'étape ci-dessous:

filage par fusion d'au moins une couche additionnelle de filaments (22) sur la première couche (20).

10. Procédé selon la revendication 8, dans lequel ladite étape de guidage de l'air à travers le système de gestion d'air comprend en outre les étapes ci-dessous:

guidage de l'air de l'ouverture d'admission vers un premier espace interne défini par les parois d'un boîtier externe et d'un boîtier interne positionnés dans le premier espace interne;
guidage de l'air dans une ouverture d'admission allongée du boîtier interne, l'ouverture d'admission allongée ayant une longueur s'étendant transversalement au sens machine et comportant une section centrale ayant une largeur dans le sens machine supérieure à celle d'une section d'extrémité opposée, et
guidage de l'air hors du boîtier interne.

11. Procédé selon la revendication 8, comprenant en outre l'étape ci-dessous:

filtrage des particules de l'air ayant servi à atténuer les filaments.

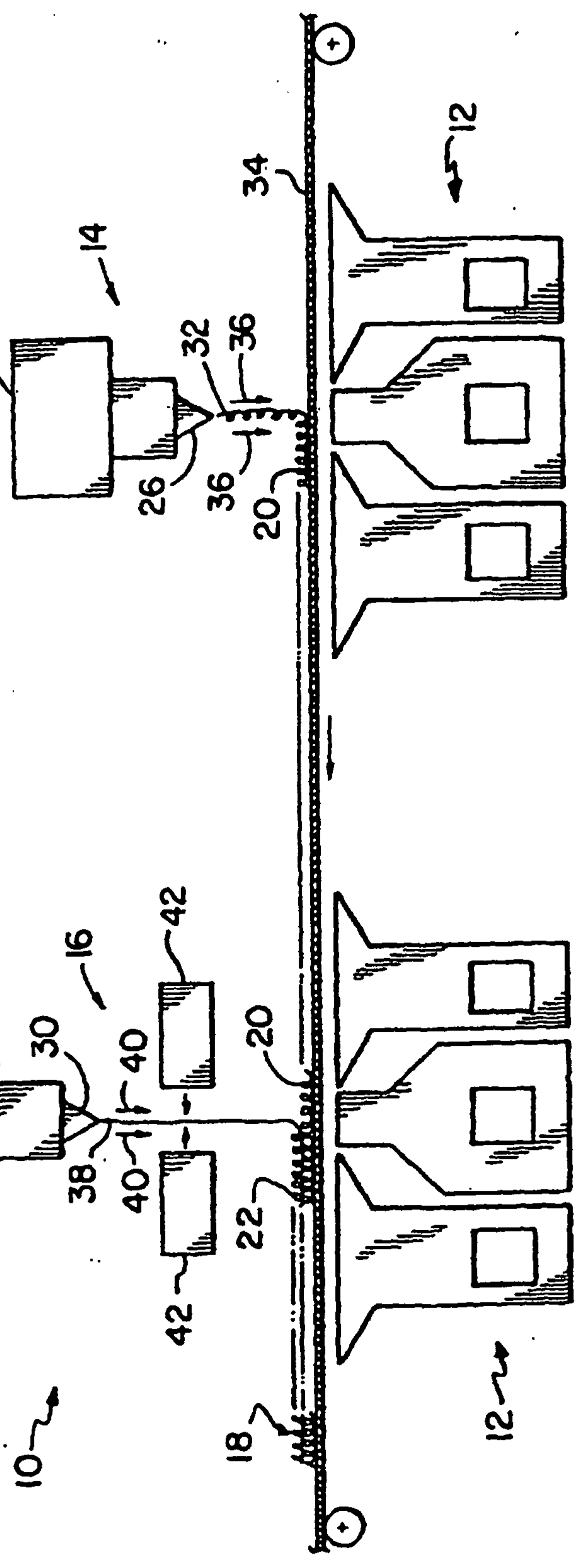

FIG. 1

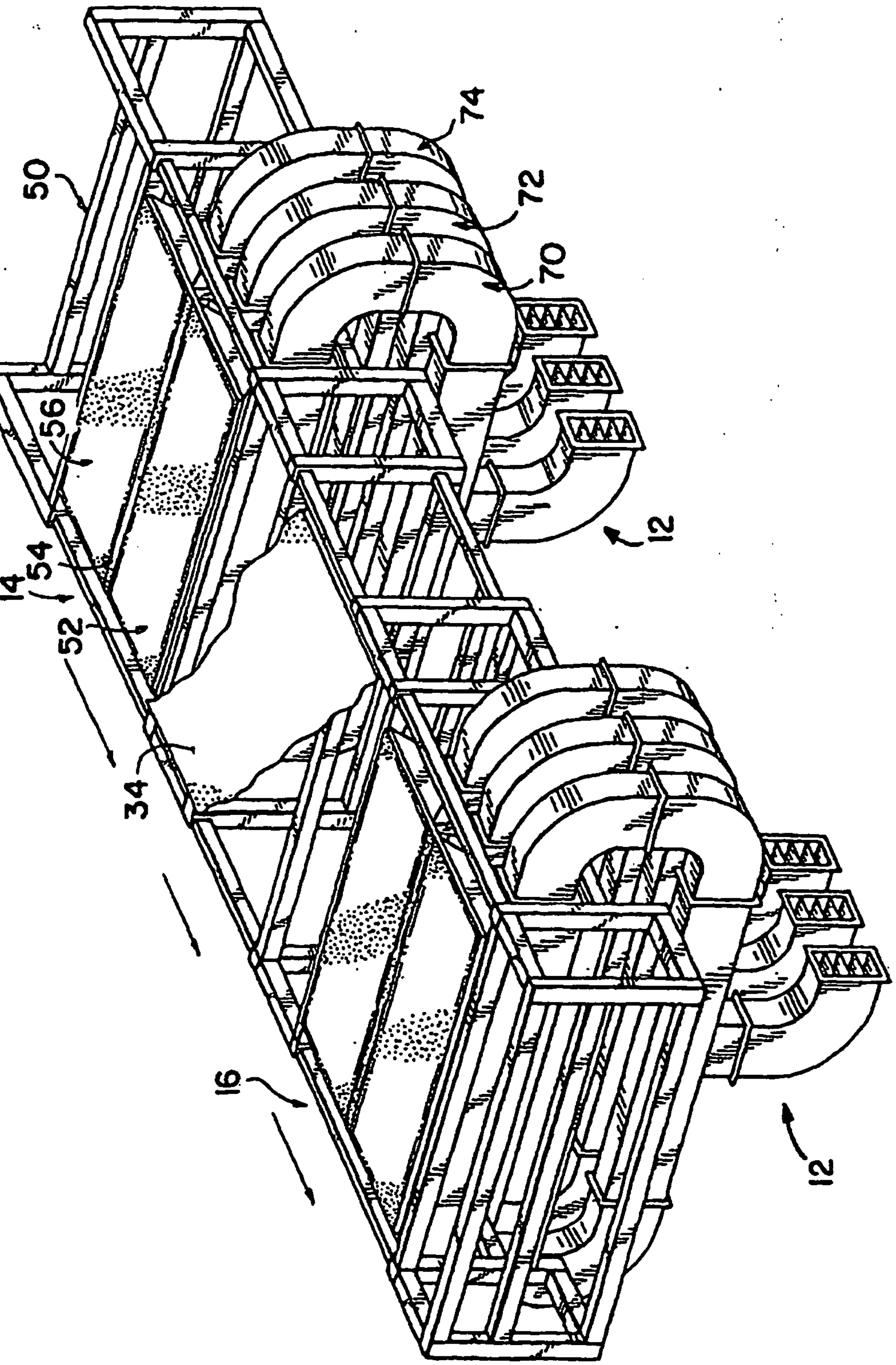

FIG. 2

FIG. 3

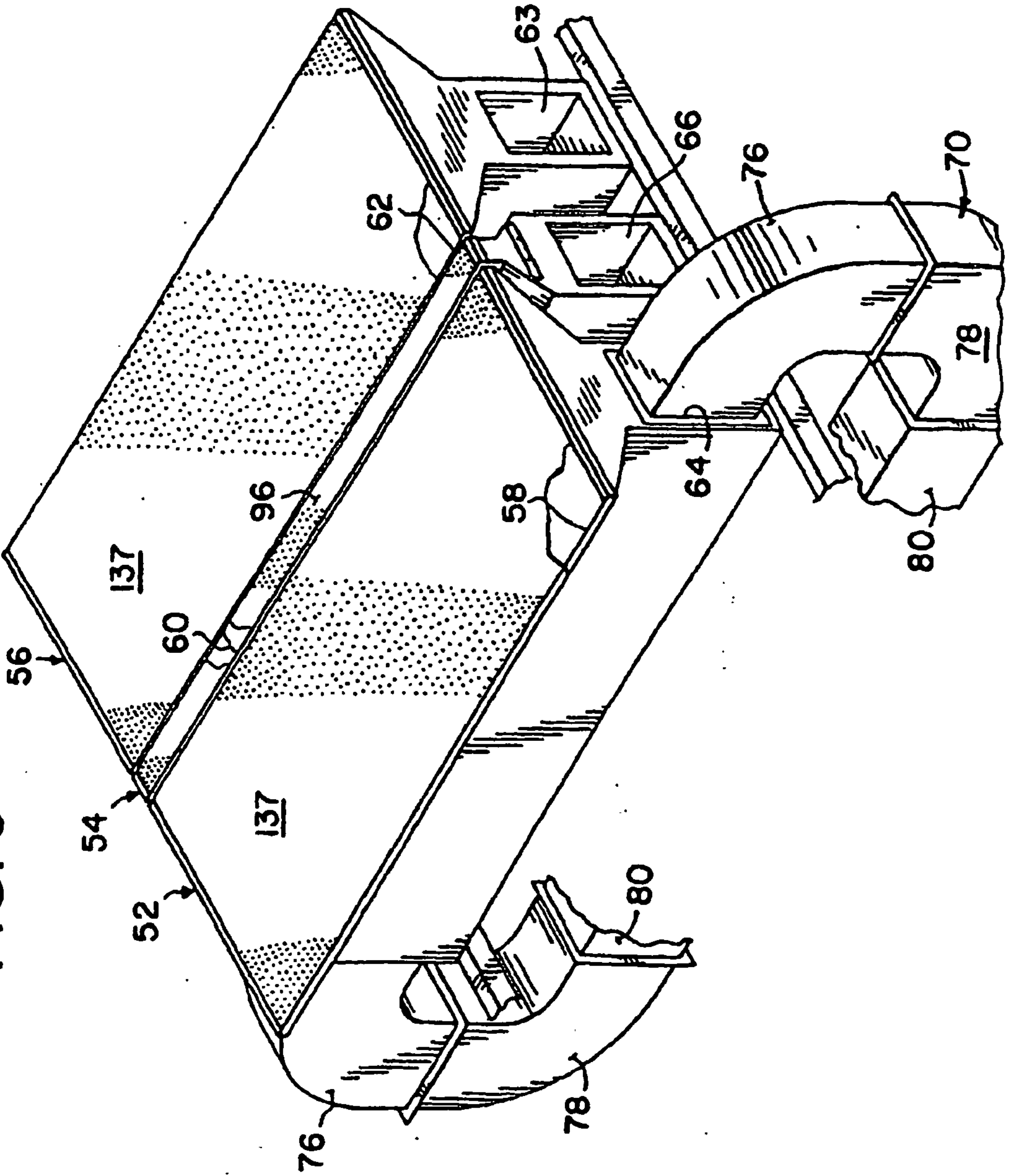

FIG. 4

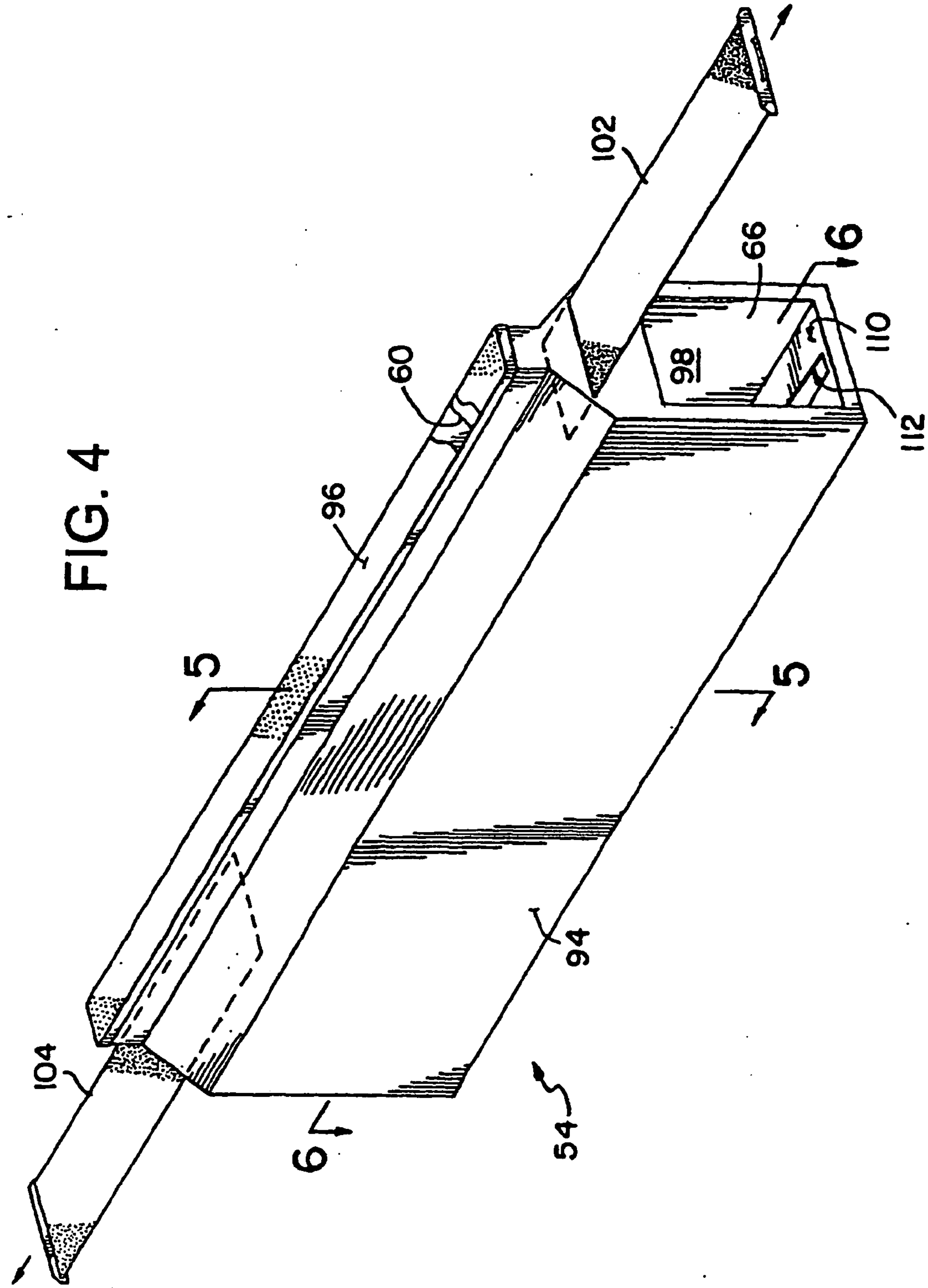

FIG. 5

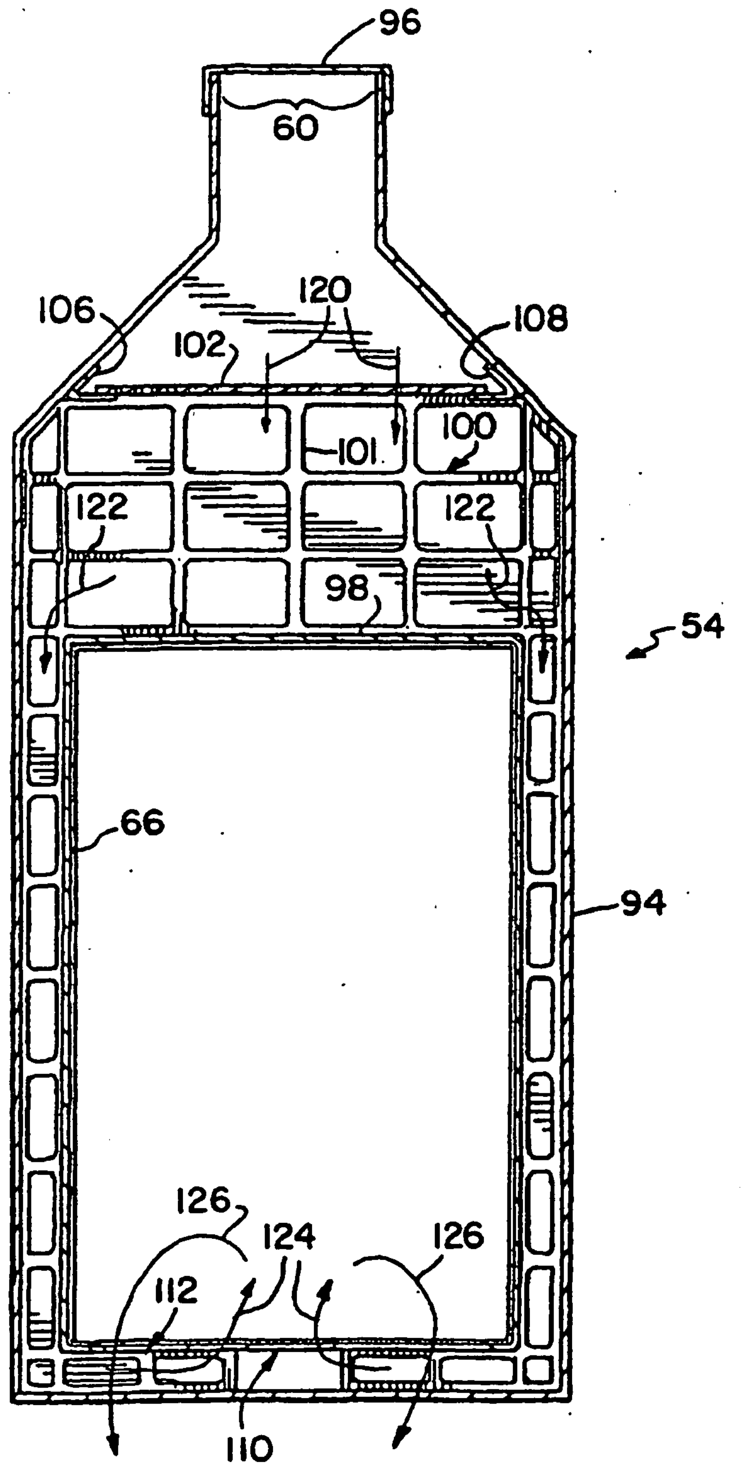
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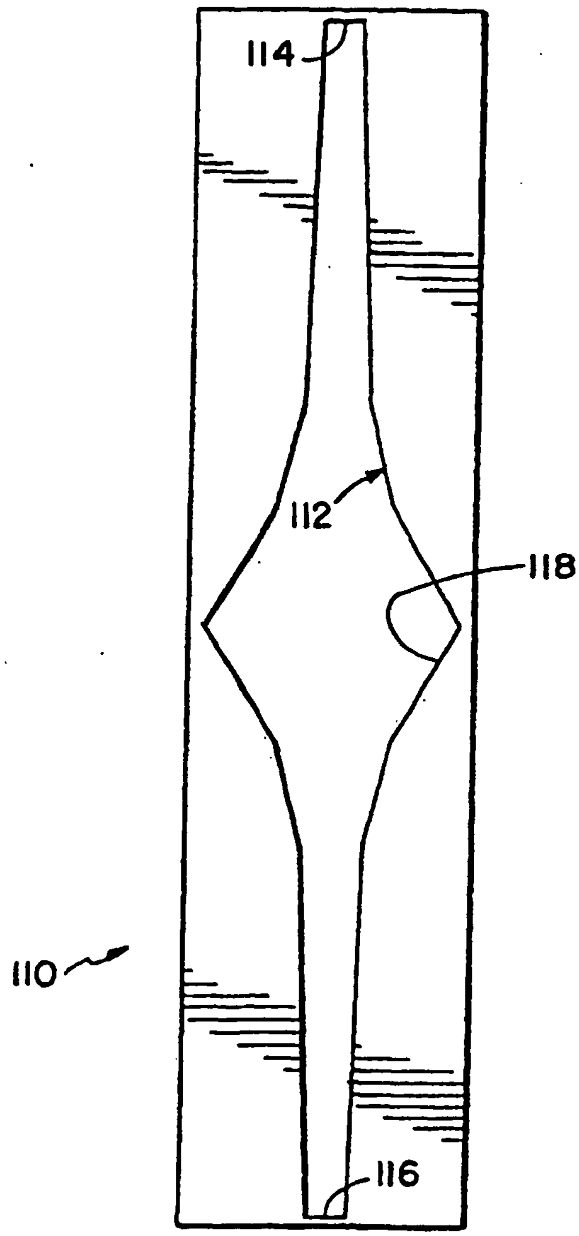
FIG. 6



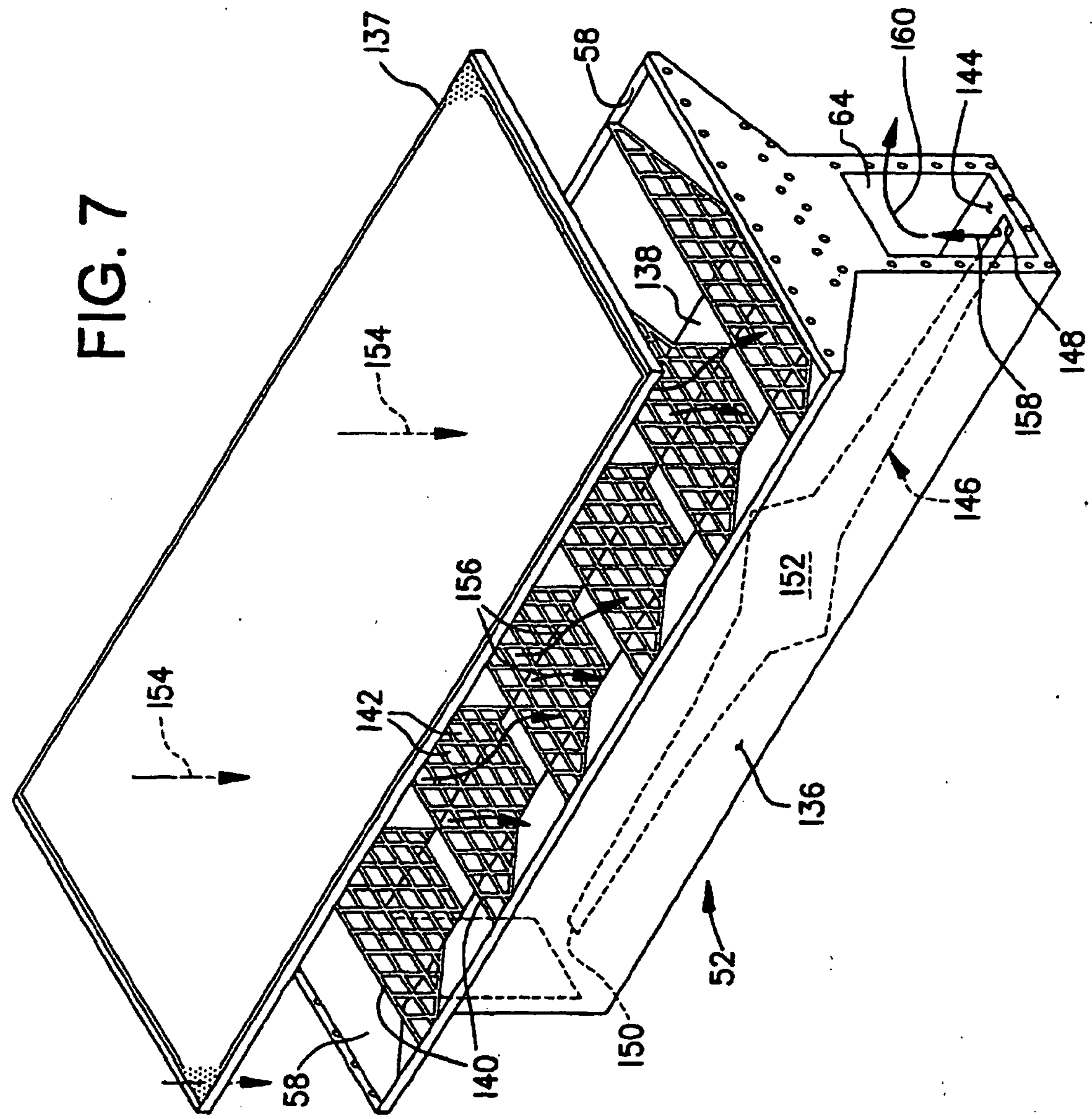

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FIG. 7

FIG. 8

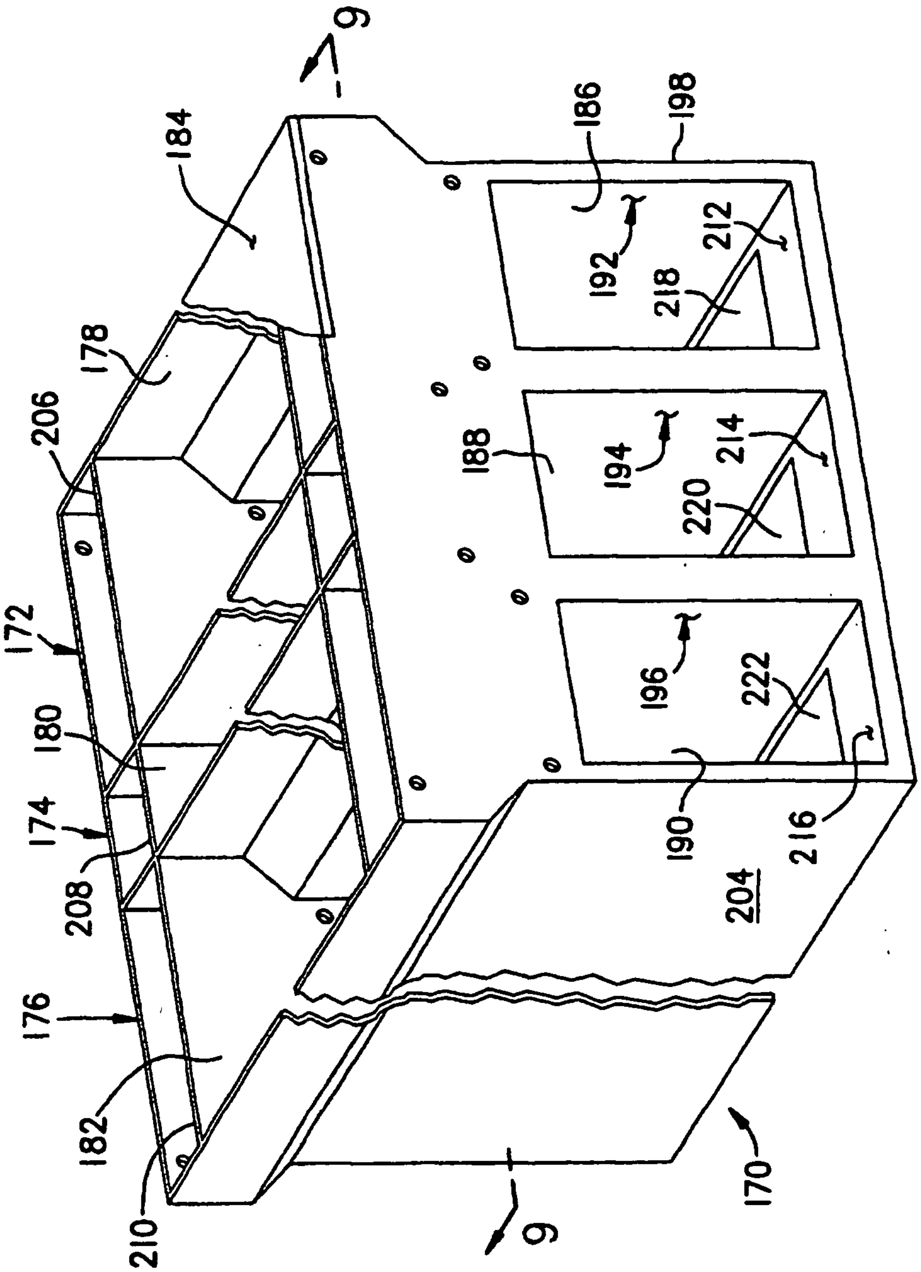
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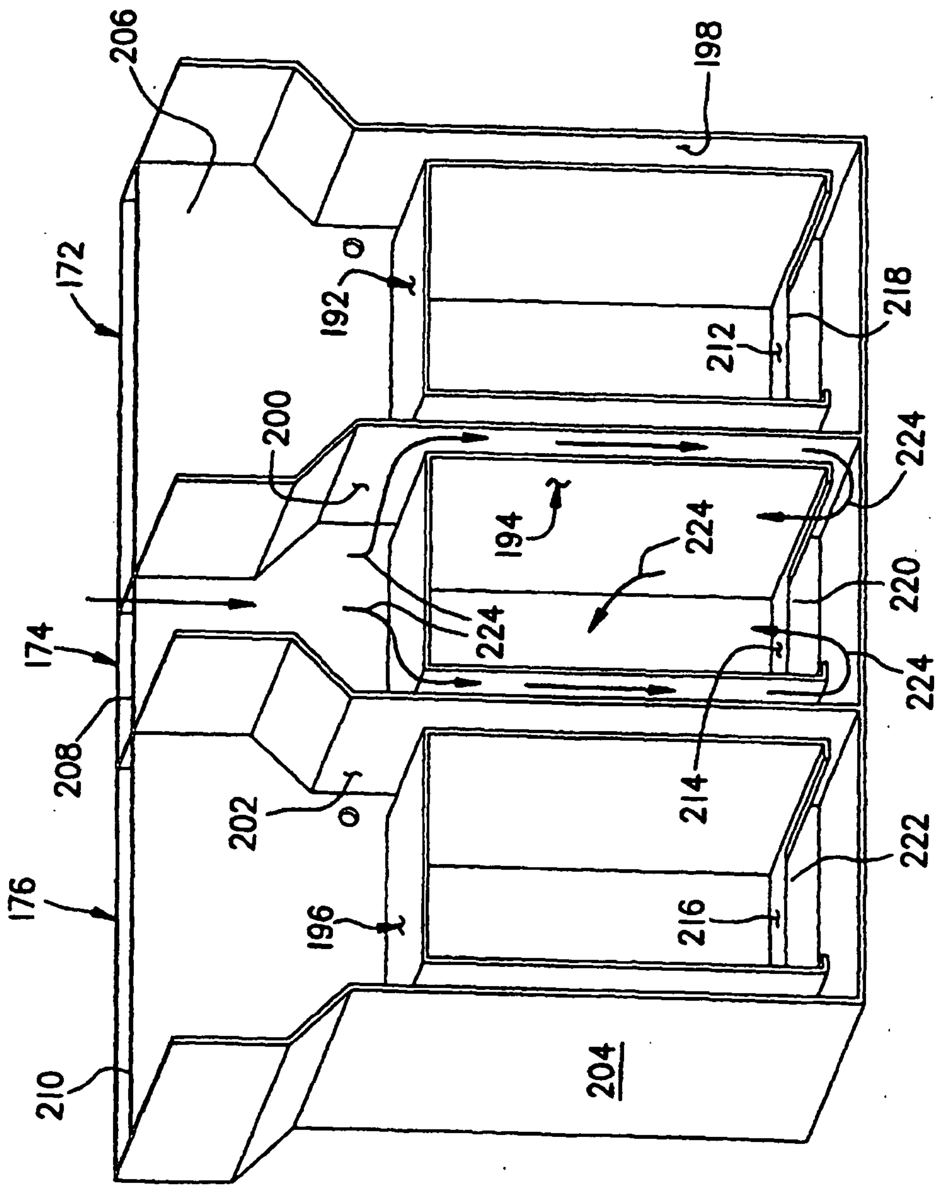
FIG. 9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